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Proximate Analysis of Selected Rice Varieties Cultivated in the Region of Narayangarh, Paschim Medinipur District, West Bengal, India

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Abstract

Rice (*Oryza sativa*, a member of the Poaceae family) is a staple food in our country as well as whole World. At present, about 40,000 varieties of rice are existing, only a few varieties are cultivated extensively, milled and polished. Manyvarieties of rice like Khanika, Jawahar, Saraswathi, Jalprabha, Neeraja, Bhagirathi, Patnai, IR-36, IR-50, Pankaj, IR-8, Sona, Kunti and others are cultivated in West Bengal in every year. Beside this Nethiya, Khitis, Bumpy gold, Manjeera, Gourav and others are popularly cultivated in our Paschim medinipur district.

We were collected Nethiya, Khitis, Bumpy gold, Manjeera and Gourav for proximate nutritional analysis as well as measure the antioxidant activities. These rices contain protein average 6 g % and fat about 0.63 g %. Antioxidant activities of Nethiya, Khitis, Bumpy gold, Gourav is higher than Manjeera. We consume rice but we have no information regarding nutritional value of local rices and antioxidant status so, accurate rice consumption is important aspect for health promotion and diseases prevention.

Key words: Rice, Nethiya, Khitis, Bumpy gold, Manjeera and Gourav

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Introduction

As the staple diet, rice (*Oryza sativa*, a member of the Poaceae family) is the most important food in the world. It is also a vital and nutritionally crucial food product that sustains more than half of the world's population. More people are incorporating rice into their diets as it plays a crucial role in maintaining a balanced diet. Across millions of hectares of farm area, rice is the most widely cultivated and significant food crop in India (Rohman et al., 2014). Now a day, about 40,000 varieties of rice are existing, only a few varieties are cultivated extensively, milled and polished. Many varieties of rice like Khanika, Jawahar, Saraswathi, Jalprabha, Neeraja, Bhagirathi, Patnai, IR-36, IR-50, Pankaj, IR-8, Sona, Kunti and others are cultivated in West Bengal in every year. It is common knowledge that eating rice regularly is healthy (Chaudhari et al., 2018). The International Rice Research Institute claims that further improvements in rice's nutritional content are necessary for the benefit of humankind. Traditional agricultural practices are combined with contemporary biotechnology to boost the nutritional content of rice. The Institute goes on to say that biofortification might make it feasible to grow rice with high concentrations of iron and zinc components (Wasan et al., 2022). Additionally, that may result in high-quality yields that both rice consumers and farmers may be willing to accept (Ito & Lacerda, 2019). Rice is mainly recognised as a food that is high in calories or energy and has a high biological value for proteins (Rayee et al., 2019). Based on the length of the grain, there are two main categories of rice are long grain and short grain. Long grain rice maintains the individuality of each grain during cooking, we ought to go with the long grain variety (Okonogi et al., 2018). Cuisines from China or India is known for their long-grained rice.Western countries choose short or medium-sized grains if we want a sticker with a more viscous appearance(Okonogi et al., 2018).Several types of rice and their products like, brown rice, parboiled rice, polished rice i.e. white rice, basmati rice, long grain Indian rice, puffed rice, Organic rice, wild rice, rice bran and rice flour etc.(Muttagi& Ravindra, 2020).Out of these there are several health benefits of rice and its products, brown rice control blood glucose level through its glycemic value,

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rice contain fibre that lowering cholesterol, fibre can minimise the risk of heart disease and stroke, different kinds of antioxidants found in brown rice that prevent the risk of cancer, improve the digestive health. Hence, in order to provide a details compilation of information's, the main objective of this study is to investigations of five types of rice and their nutritive values that cultivated the region of Naranyangarh, Paschim Medinipur district.It is an innovative study conducted first time in this area.

Methodology

Collection of rice

Five varieties of rice *(Oriza sativa)* including khitish, nithya, manjeera, bumpy gold and gourav were collected from the local farmer's house who prepares rice from paddy seeds at home from the region of Naranyangarh, Paschim Medinipur district.

Fig 1: Five verities of rices.

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Preparation of rice dust

After collection of the rices were blended by the mixture grinder and put into air tight container separately (Thennakoon& Ekanayake, 2021).

Proximate physical analysis

Determination of length of rice sample

Measurement of length of rices by using millimetre scale of both parboiled rice and paddy rice(Muttagi& Ravindra, 2020).

Proximate nutrient analysis

Proximate analysis for the moisture, protein, ash, fat and carbohydrate (including fiber) of the dried rice dust were estimated according to different standard analytical methods developed for proximate analysis (AOAC, 2003) (Farzana & Mohajan, 2015).

Determination of protein from rice dust

The crude protein of the rice dust was determined by Micro-Kjeldahl method (Chukwu&Ibrahim, 2009). Briefly, the percentage of nitrogen of rice samples was calculated and the percentage of protein in the samples was calculated by multiplying the percentage of N with an empirical factor 6.25.

N (%) = Titration reading blank reading Strength of acid × 100/S × 100/ weight of sample

Protein content (%) = Total N (%) × 6.25

[N= Nitrogen, S= Sample]

Determination of fat from rice dust

Total lipid content of dried rice dust was determined by method as described in Bligh and Dyer method and calculated using the following equation (Pyne et al, 2023).

Total lipid content (%) = Weight of residue/ Weight of sample taken ×100

Determination of ash from rice dust

The ash content of the rice samples was determined as the inorganic residues such as oxides, sulphates, silicates and chlorides left behind, in the dry rice dust. The samples heated to the temperatures of 500℃ - 600℃ in a muffle furnace for about 3 hours.

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Afterwards, the percentage of ash content was calculated (Mansur et al, 2013).

Ash content (%) = Weight of ash/ Weight of sample taken ×100

Determination of moisture from rice dust

Determination of moisture of dried rice dust was conducted following the (AOAC, 2003) method (Modibbo et al, 2014). Rice dust samples were dried at elevated temperature and reported the loss in weight in terms of moisture by the following equation.

Moisture content (%) = Loss of weight/ Weight of sample taken × 100

Determination of carbohydrate from rice dust

The carbohydrate contents were determined by calculating the difference between 100% (accepted total value of nutritional status) and the sum of values of moisture, protein, lipid and ash (Sulieman&Sidahmed, 2012).

Total carbohydrate (%) = 100 - (% Moisture + % protein + % fat + % Total Ash)

DPPH radical scavenging activity assay

The free radical scavenging activity of rices wasmeasured by 2,2′- diphenyl-1-picrylhydrazyl (DPPH) assay according to the laboratory standard method (Munteanu&Apetrei, 2021).

The scavenging activity was estimated based on the percentage of DPPH radical scavenged as the following equation:

Scavengingeffect%=controlabsorbance-sampleabsorbance/controlasbsorbance×100

Statistical analysis

Data are presented as mean ± standard error of means obtained from 5 verities of rice to evaluate variances between the groups. The statistical analysis was performed by one way ANOVA, followed by Bonferroni's modificationto determine statisticalsignificance ($P < 0.05$, $P < 0.01$, $P < 0.001$) among all (Muttagi& Ravindra, 2020).

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Results and Discussion

Length of paddy seeds

Length of paddy seeds of khitish and gourav significantly ($P < 0.01$) difference but khitish and nithiya significant ($P < 0.05$) higher among length of five varieties paddy seeds (Fig 2).

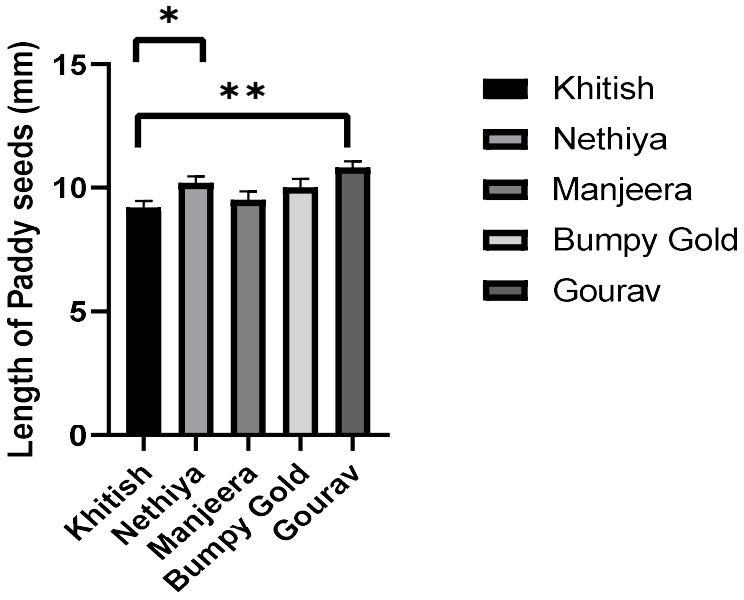

Fig 2: Comparison among the length of five varieties paddy seeds. Data were expressed as mean ± standard error and data were analysed by anova multiple comparison two tail 't' test with Holm-Sidak's multiple comparisons test. * Indicates $P < 0.05$, ** indicates $P < 0.01$.

Length of parboiled rice

Length of parboiled rice of khitish and manjeera significantly ($P < 0.05$) difference, manjeera and gourav significant ($P < 0.001$) difference and bumpy gold and gourav significant ($P < 0.01$) difference. Here, khitish and manjeera significantly difference ($P<0.05$) has higher among length of five varieties paddy seeds (Fig 3).

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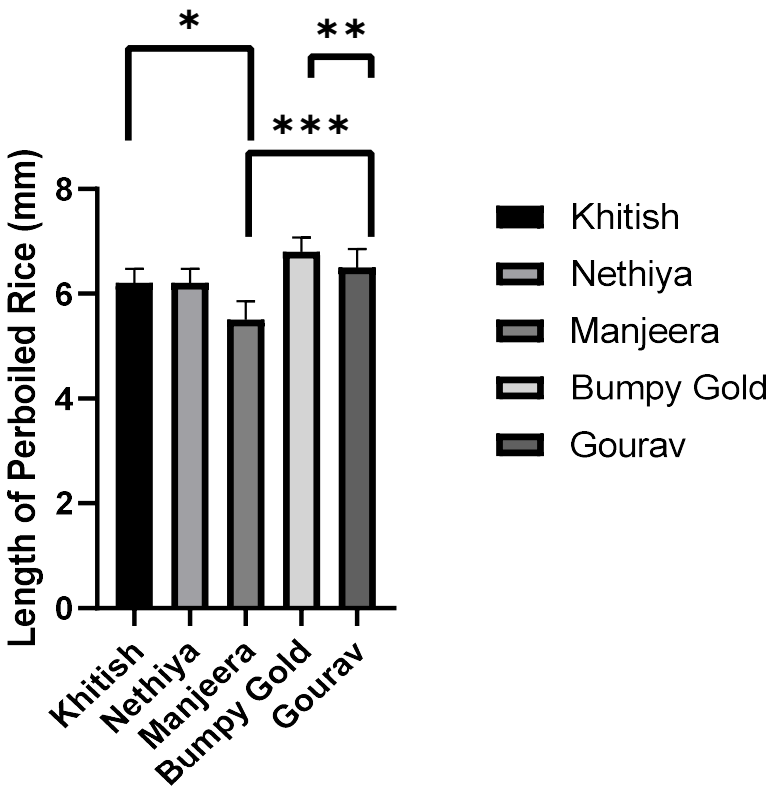

Fig 3: Comparison among the length of five varieties parboiled rice. Data were expressed as mean ± standard error and data were analysed by anova multiple comparison two tail 't' test with Bonferroni's multiple comparisons test. * Indicates P< 0.05, ** indicates P< 0.01 and *** indicates P< 0.001.

Protein content

The protein content of the five varieties rice dust was determined by Micro-Kjeldahl method. Based on AVOVA table data, Khitish to gourav were significantly difference (P<0.001). But there was no significant difference for protein content in between manjeera and gourav among five varieties rice including khitish, nithya, manjeera, bumpy gold and gourav (Fig. 4).

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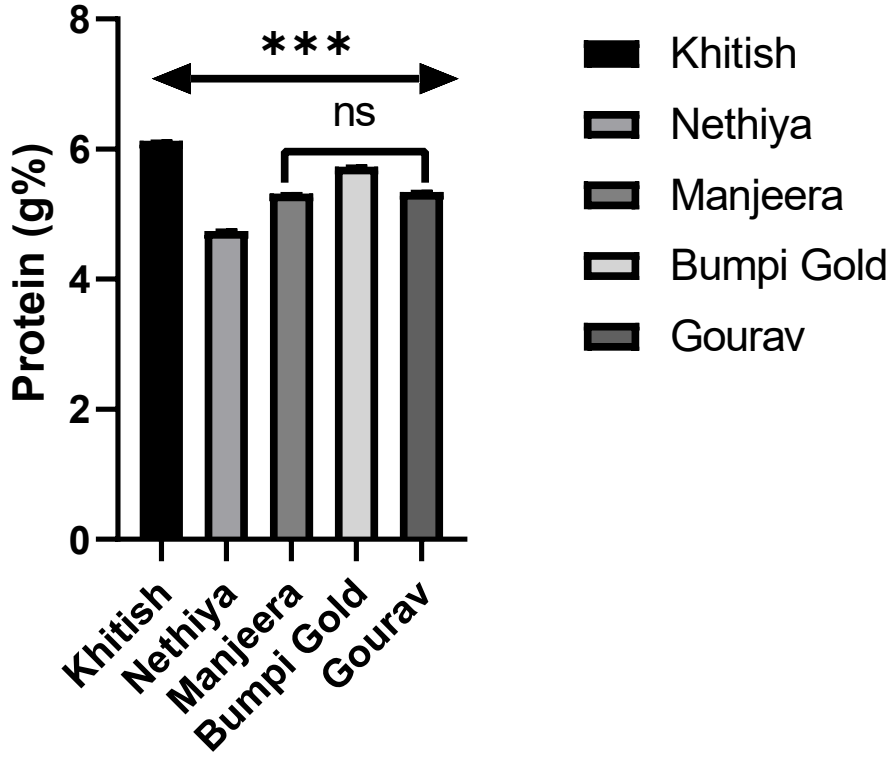

Fig 4: Comparison of protein content among the five varieties rice. Data were expressed as mean ± standard error and data were analysed by anova multiple comparison two tail 't' test withSidak's multiple comparisons test. * Indicates P< 0.05, ** indicates P< 0.01 and *** indicates P< 0.001, ns- no significant difference.

Fat content

Based on the ANOVA table, khitish and bumpy gold significantly difference (P<0.001) among five varietiesparboiled rice. But there was no significant difference among khitish, nithya and manjeer and between bumpy gold and gourav (Fig-5).

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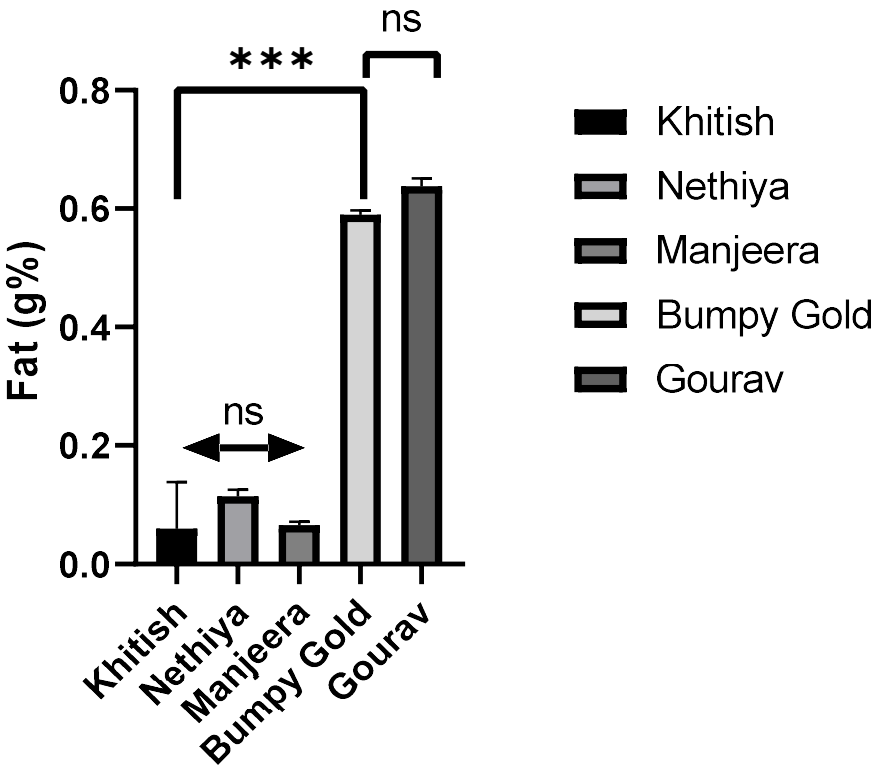

Fig 5: Comparison among the percentage of fat in five varieties parboiled rice. Data were expressed as mean ± standard error and data were analysed by anova multiple comparison two tail 't' test with Bonferroni's multiple comparisons test. * Indicates P< 0.05, ** indicates P< 0.01 and *** indicates P< 0.001, ns- no significant difference.

Ash content

Based on data obtained by ANOVA table data, there were significant difference (P<0.001) for ash content in five varieties of rice including khitish, nithya, manjeera, bumpy gold and gourav (Fig-6).

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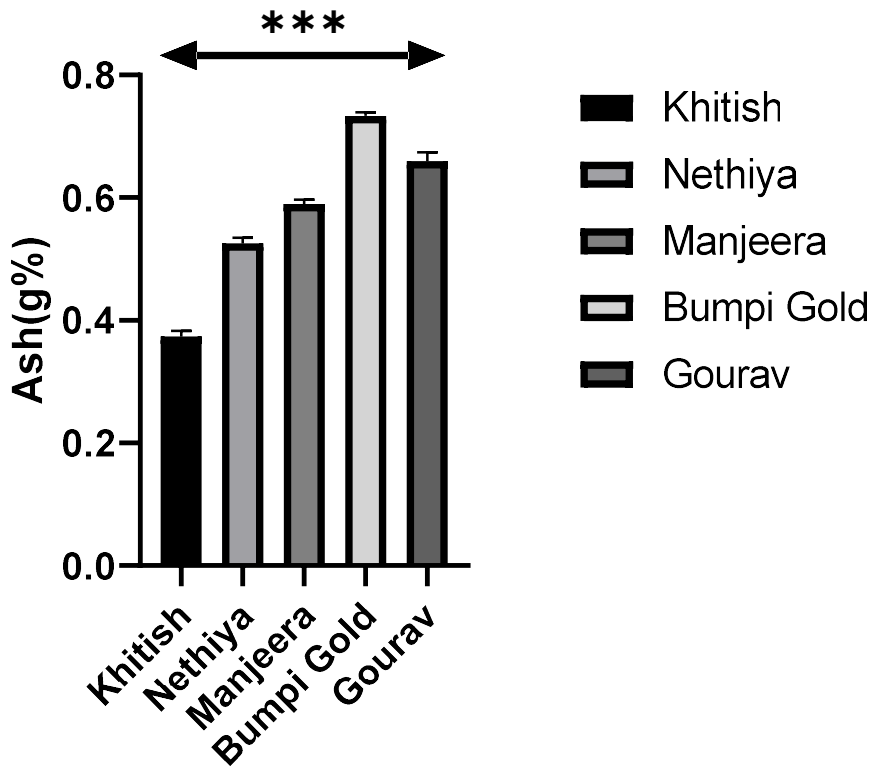

Fig 6: Comparison among the percentage of ash content in five varieties parboiled rice. Data were expressed as mean ± standard error and data were analysed by anova multiple comparison two tail 't' test with Bonferroni's multiple comparisons test. * Indicates P< 0.05, ** indicates P< 0.01 and *** indicates P< 0.001, ns- no significant difference.

Moisture Content

Moisture content of five varieties parboiled rice, there was no significant difference between khitish and nithya. But there was significantly difference (P<0.001) among nithya, manjeera, bumpy gold and gourav (Fig-7).

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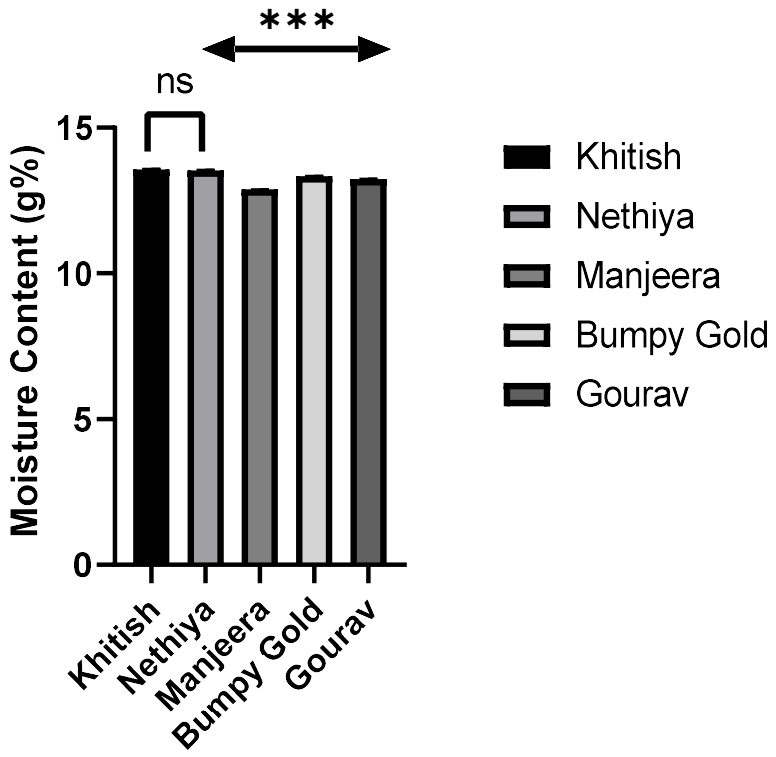

Fig 7: Comparison among the percentage of moisture content in five varieties parboiled rice. Data were expressed as mean ± standard error and data were analysed by anova multiple comparison two tail 't' test with Bonferroni's multiple comparisons test. * Indicates P< 0.05, ** indicates P< 0.01 and *** indicates P< 0.001, ns- no significant difference.

Carbohydrate content

The carbohydrate content of five varieties rice were determined by determined by calculating the difference between 100% (accepted total value of nutritional status) and the sum of values of moisture, protein, lipid and ash (Sulieman & Sidahmed, 2012). Based on data obtained ANOVA table, there were no significant difference for carbohydrate content among five varieties of parboiled rice including khitish, nithya, manjeera, bumpy gold and gourav (Fig 8).

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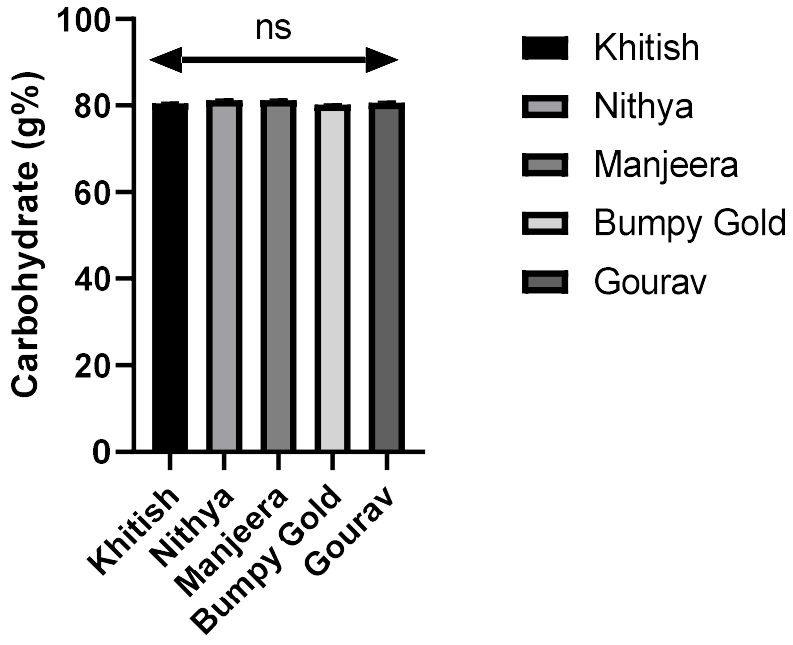

Fig 8: Comparison among the percentage of carbohydrate content of five varieties parboiled rice. Data were expressed as mean ± standard error and data were analysed by anova multiple comparison two tail 't' test with Tukey's multiple comparisons test. ns-no significant difference.

DPPH radical scavenging activity

The antioxidant activity of five varieties parboiled rice including khitish, nithya, manjeera, bumpy gold and gourav were significantly difference ($P<0.001$).But khitish and nithya significantly difference ($P<0.01$) higher and there is no significant difference between bumpy gold and gourav (Fig-8).

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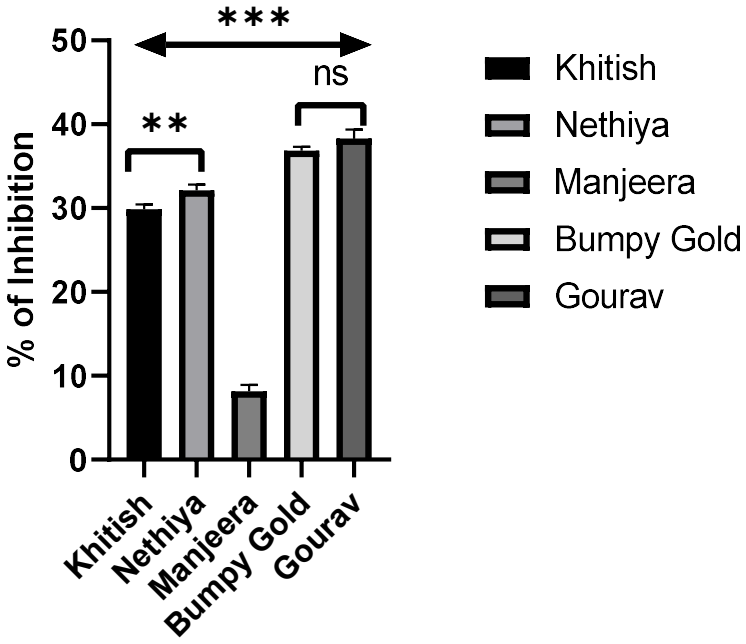

Fig 9:Comparison among the percentage of inhibition in five varieties parboiled rice. Data were expressed as mean ± standard error and data were analysed by anova multiple comparison two tail 't' test with Bonferroni's multiple comparisons test. * Indicates P< 0.05, ** indicates P< 0.01 and *** indicates P< 0.001, ns- no significant difference.

Conclusion

Rices like Nethiya, Khitis, Bumpy gold, Manjeera, Gourav and others are popularly cultivated in our Paschim medinipur district. We were collected Nethiya, Khitis, Bumpy gold, Manjeera and Gourav for proximate nutritional analysis as well as measure the antioxidant activities. This is the first time research on local rices collected from farmers and we established the macronutrients contents and antioxidant status of these rices. This will be very interesting topic among rice lovers that those rices contain god amount of protein and low amount of fat for better health.

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